

Amendments to the Drawings:

The attached sheet of drawings includes a clearer copy of Fig. 42. Fig. 42 has not been altered or amended. This sheet, which includes Fig. 42, replaces the original sheet including Fig. 42.

Attachment: Replacement Sheet

REMARKS

Claims 37-44 are pending. Claims 37-40 have been amended. Claims 1-36 were previously canceled. No claims have been added. Therefore, claims 37-44 are pending. Applicant respectfully requests reconsideration of the claims in view of the above amendments and the following remarks.

The Office Action of June 15, 2011 (“Office Action”) raised a number of rejections, and rejected all pending claims. Applicants respectfully provide the following response.

I. Drawings

The Office Action objected to Fig. 42 on the grounds that the figure is not clearly seen, and required corrected a drawings sheet.

Applicants submit the attached replacement sheet, which includes a clearer version of Fig. 42. Fig. 42 has not been amended.

II. Claim Objections

The Office Action objected to the format of claims 38-39. Applicants have amended claims 38-39 to address the objections.

III. Claim Rejections Under 35 U.S.C. §112

The Office Action rejected claim 37 and its dependent claims under 35 U.S.C. §112 for “being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention,” and for omitting an “exhaust port for discharging exhaust gas out of the engine.”

Specifically, the Office Action concluded that the phrase “while maintaining substantially constant volume” renders claim 37 indefinite “since it is not clear that by which ways(s) or by which configuration of the engine component(s) is/are affected on maintaining volume at substantially constant.” In response, Applicants have amended claim 37 to specify that “while maintaining substantially constant volume” means maintaining the volume of a combustion chamber defined by the housing and the piston.

The Office Action also concluded that the phrase “in a manner that is smooth and continuous” renders claim 37 indefinite “since it is not clear that which component(s) of the engine, such as volume size, shaft rotation, the phases, etc., is/are to be considered in smooth and continuous manner.” In response, Applicants have amended claim 37 to specify that it is the volumes defined by the housing and the piston that vary, over the course of shaft rotation, to define successive volumes in differing amounts for phases of compression, combustion, and expansion, in a manner that is smooth and continuous.

As for the Office Action’s rejection of claim 37 for omitting an “exhaust port for discharging exhaust gas out of the engine,” Applicants have amended claim 37 to specify that the engine has an exhaust port.

The Office Action also rejected claim 40 as being indefinite. Specifically the Office Action concluded that the clause “maintaining conditions under which the fuel undergoes spontaneous ignition” renders the claim indefinite since, according to the Office Action, it is not clear what conditions are to be maintained.

Applicants respectfully note that the condition to be maintained is the pressure within the combustion chamber, and have amended claim 40 accordingly. Applicants respectfully note that the embodiment in Figs. 41 and 42 implements an “HCCE” cycle, and that embodiments of the HCCE cycle “include the step of causing the compression stroke to produce a pressure of the working medium that would cause auto-ignition when fuel is added to it” (see paragraph 7, page 2 lines 10-12 of the application as filed) and “causing combustion of fuel under substantially constant volume conditions” (page 2 line 14 of the application as filed). Accordingly, Applicants have amended claim 40 to specify that it maintains substantially constant volume of the combustion chamber.

Therefore, Applicants respectfully submit that all rejections under §112 have been addressed.

IV. Claim Rejections Under 35 U.S.C. §101

The Office Action rejected claim 37 and its dependent claims under 35 U.S.C. §101 on the basis that the claims are inoperative and lack utility because “the engine has no exhaust port for discharging exhaust gas out of the engine.”

In response, Applicants have amended claim 37 to specify that the engine has an exhaust port.

Therefore, Applicants respectfully submit that the rejection under §101 has been addressed.

V. Claim Rejections Under 35 U.S.C. §102 and §103

The Office Action rejected independent claim 37, and dependent claims 38 and 39, under 35 U.S.C. §102 as anticipated by a document to Lionel Montalvo Morales (Pub. Number DT 24 38 410 A1; herein “Morales”). The Office Action also rejected the remaining claims (dependent claims 40-44) under 35 U.S.C. §103 over Morales in view various combinations of U.S. patent 3,845,745 to Dunlap et al. (herein “Dunlap”), U.S. patent 4,059,086 to Tsubuchi (herein “Tsubuchi”), and international patent application publication number WO 03/74840 A2 to Shkolnik (herein “Shkolnik”).

Applicants respectfully disagree. The engine in Morales is considerably more complex than the engine described in claim 37. The complexity of the Morales engine reveals the distinctions between the Morales invention and claim 37.

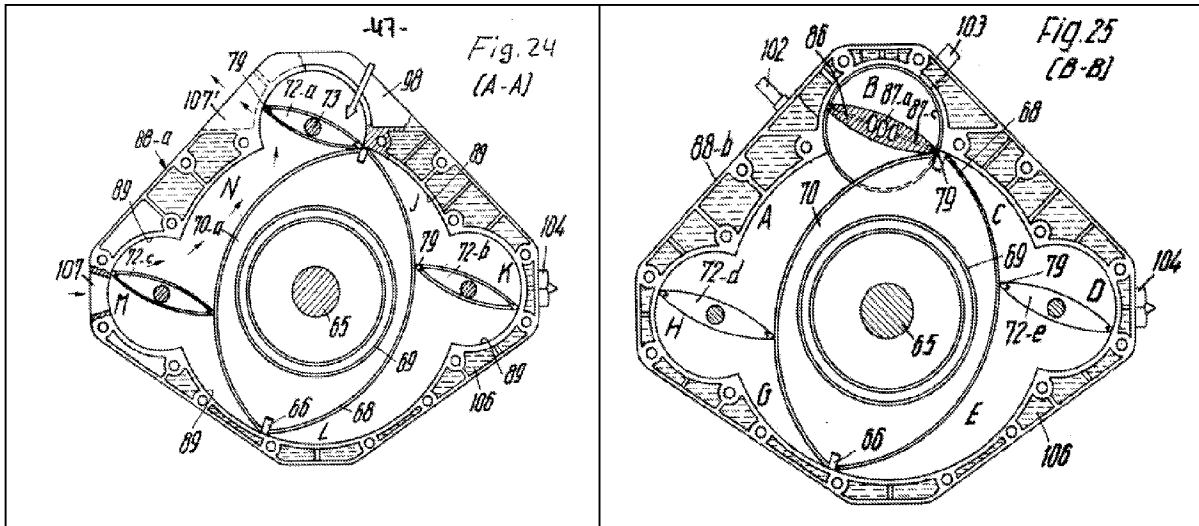
Claim 37 (as amended) requires, among other things, “providing, in a housing, a piston and a shaft, wherein over a course of rotation of the shaft, the housing and piston successively define volumes in differing amounts within the housing for phases of compression, combustion, and expansion.” Further, claim 37 requires that the “third volume” (i.e., the expanded volume) is greater than the “initial volume” (i.e., the volume of the working medium before it is compressed).

Thus the housing and piston of claim 37 form volumes that perform the three phases of the engine cycle: (i) the compression, (ii) the combustion and (iii) the overexpansion of the working medium. Applicants note that the piston forms part of the volume during all three phase, including the overexpansion of the working medium.

In contrast, the engine and operation of Morales does not have a piston that forms part of the volume during all three phase, including the overexpansion of the working medium. In fact, the engine and operation of Morales is significantly different.

The formation of the various chambers/volumes inside the Morales engine employs at least two distinct large rotors (auxiliary rotor 70a and rotor 70) that operate in

two completely different chambers. Morales engine's method of operation is illustrated in Figs 28- 41, and described in the associated text as cited in the Office Action. The chambers and rotors are illustrated in Morales Fig. 24 and Fig. 25, respectfully.



In short, Morales does not have a common piston or rotor in the formation of its compression, combustion and over-expansion chambers. Some examples are provided below.

A. Example: Morales Compression Chamber

The unusual operation of the Morales engine can be understood, for example, with respect to the expansion of the working medium after combustion. Specifically, as shown in Morales Figs. 35-40 and in the related text (Morales page 16, line 3 to page 17, line 14) the expansion of the working medium begins in one chamber and against rotor 70 (see Fig. 35, and the text on page 16: “the expansion acting on the piston rotor 70 begins” –page 16, line 22). In Fig. 35, the working medium is beginning to expand against piston 70, and the expansion chamber is formed by piston 70, “valve” 86, and the housing:

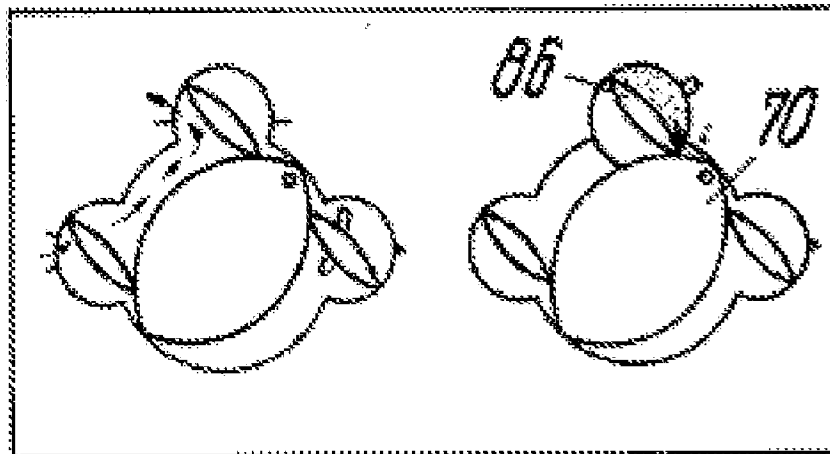
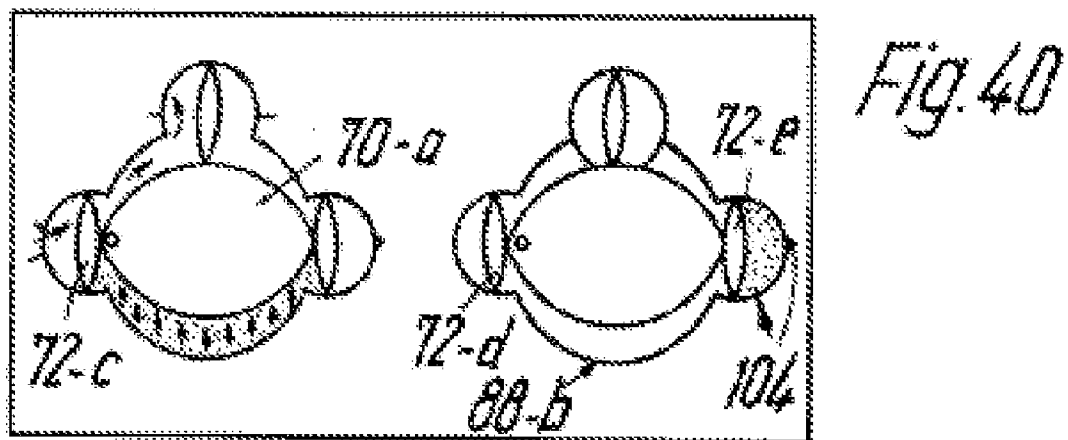


Fig. 35

However, the working medium does not complete its over expansion in that chamber. Rather, during the expansion, the working medium later passes through opening 100 (see Fig. 37), and then the “expansion continues to act on the rotor piston 70a” (page 17, lines 7-8). This is illustrated, for example, in Morales Fig. 40. In Fig. 40, the expansion continues against piston 70a, and the expansion chamber is formed by piston 70a, “valve” 72c, and the outer housing. Piston 70 no longer forms a part of the expansion chamber.



Therefore, the Morales compression, combustion and expansion volumes are not formed by a common rotor. Thus, it would be incorrect to conclude that the Morales engine teaches a “housing and piston successively define volumes in differing amounts within the housing for phases of compression, combustion, and expansion” as required by claim 37.

B. Example: Morales Combustion Chamber

A similar observation may be made with respect to Morales’s combustion chamber. Prior to combustion, Morales compresses the working medium in a compression chamber that is formed by piston 70a, and “valve rotors” 72b, along with the outer housing (see, for example, Figs. 28).

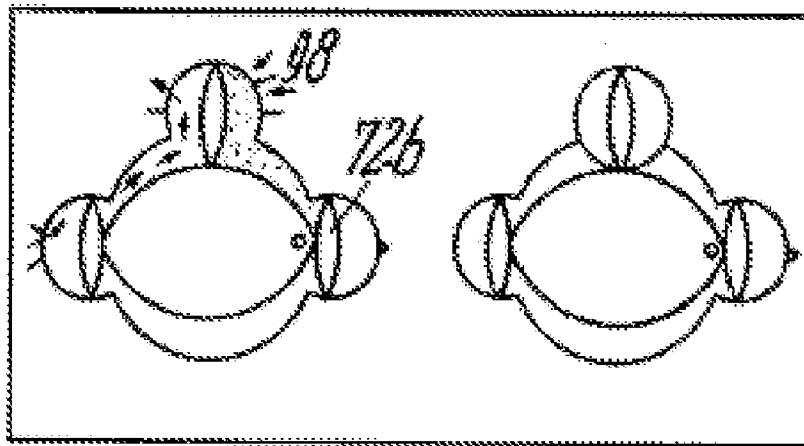


Fig. 28

Next, the working medium is transferred to a combustion chamber. However, the combustion chamber is formed only by the outer housing and valve-rotor 86 - as shown in Fig. 34 - and not by rotor 70 or 70a. Applicant respectfully notes that valve-rotor 86 is not expressly identified in Fig. 34, but is identified in other figures, such as Fig. 25 and Fig. 35, and is therefore identifiable in Fig 34:

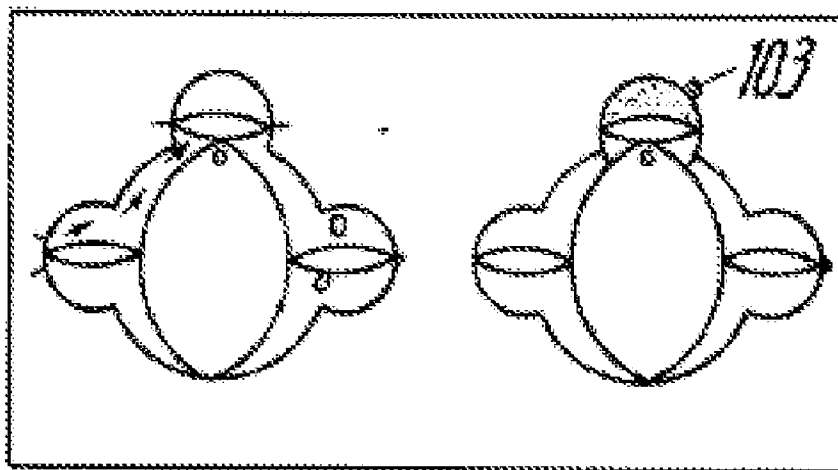


Fig. 34

Therefore, again, the Morales compression, combustion and expansion volumes are not formed by a common piston.

For at least these reasons, claim 37 is not anticipated by Morales. In addition, all claims that depend from claim 37 are not anticipated by Morales, and are not rendered

obvious by the combination of Morales and the other references as mentioned in the Office Action.

All pending claims are believed to be in a form suitable for allowance. Therefore, the application is believed to be in a condition for allowance. The Applicants respectfully requests early allowance of the application. The Applicants request that the Examiner contact the undersigned, Thomas J. Tuytschaevers, if it will assist further examination of this application.

Applicants petition for a three month extension of time. In the event that a further extension is needed, this conditional petition of extension is hereby submitted. Applicant requests that deposit account number 19-4972 be charged for any fees that may be required for the timely consideration of this application.

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Respectfully submitted,

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